AGRICULTURAL ENGINEERING

THE JOURNAL OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

VOL. 1 EDITED AT AMES, IOWA NO. 4

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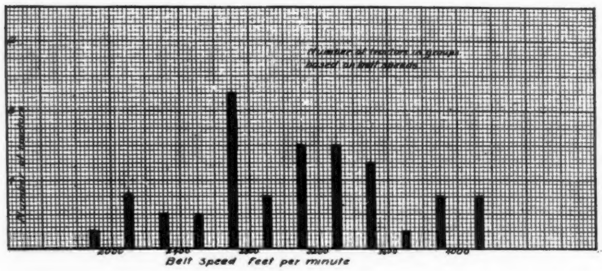
Published Monthly. Subscription $3.00 per year. Canada 50 cents additional; foreign $1.00 additional.
30 cents per copy

Why Standardize Tractor Ratings?

By O. W. Sjogren [1]

AT the annual meeting of the A. S. A. E. in December, 1917, it was decided to adopt the recommendation of the S. A. E. as to tractor ratings and belt speeds, which recommendations read as follows:

"The draw bar rating shall be eighty per cent of the horse power that the tractor is guaranteed to develop at the draw bar continuously for two hours, the tractor being in good condition and properly operated at rated engine speed. The tests should be taken on ground sufficiently firm to give the traction wheels a good footing, a firm sod being preferable."



"The belt horse power rating shall be eighty per cent of the horse power the engine is guaranteed to deliver at the belt pulley continuously for two hours, the tractor being in good condition and properly operated at rated engine speed."

It may be interesting to compare the performance of a large number of tractors tested under similar conditions and note how nearly they conform to these recommended standards. In this discussion, records of forty-four different models of tractors have been used. Records from seventy different models of tractors will be available with the closing of the Nebraska tests for this season.

In the following figures the results of the maximum belt horse power tests are used as 100 per cent and indicate the manufacturers' rating in percentages of maximum power developed continuously for one hour and show how nearly this conforms to the eighty per cent standard:

Rated belt horse power in percentages of maximum

No. of tractors—60-70%, 1; 70.1-80%, 7; 80.1-90%, 13; 90.1-100%, 19; above 100%, 2.

(Two tractors were not rated).

Thus it is seen that only seven machines fall within the set standards, while thirty-five machines carry a rating higher than permitted by the standard.

On the draw bar work it was found that except in one or two instances no difficulty was had in securing the rated horse power if the rated belt horse power was developed. The maximum draw bar horse power was not taken through any extended period but the rated load was carried for ten hours. The same method of figuring is used here as in the previous case:

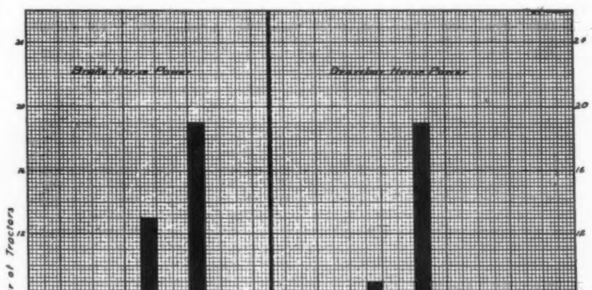
Rated draw bar horse power in percentages of maximum

No. of tractors—50-60%, 4; 60.1-70%, 9; 70.1-80%, 19; 80.1-90%, 5; 90.1-100%, 2; above 100%, 1.

(Four tractors had no draw bar rating).

Thus it is seen that thirty-two tractors fall within the standards set for the draw bar rating as compared to only seven falling in this class on the belt test. Eight carry a rating higher than the standard, one of these being rated at more than it can actually develop. The charts show these conditions.

The piston displacements in cu. in. per horse power minute show some interesting results and indicate a great variation in this one factor. The following figures are all based on maximum belt horse power maintained at rated speed for one hour. Of the forty-four tractors the lowest piston displacement is 9420 cu. in. while the highest is 17400. The average for all tractors is 12845 cu. in.



[1] Head of Agr. Engr. Dept., University of Nebraska. Mem. Amer. Soc. A. E.

Dividing the tractors into classes based on types of cylinders the following results are secured:

2 cylinder horizontal	(9 tractors)	10940 cu. in. displace't
4 cylinder horizontal	(9 tractors)	11714 cu. in. displace't
4 cylinder horizontal	(24 tractors)	13534 cu. in. displace't
6 cylinder horizontal	(2 tractors)	13890 cu. in. displace't

A classification as to bore of cylinder gives the following: Bore of cylinder in inches.

3 " to 4"	8 tractors	13776 cu. in. displacement
4⅛" to 5"	17 tractors	13660 cu. in. displacement
5⅛" to 6"	7 tractors	11960 cu. in. displacement
6⅛" to 7"	6 tractors	11500 cu. in. displacement
above 7"	6 tractors	11275 cu. in. displacement

BELT SPEED

A very great variation exists in the belt speeds, in feet per minute, of the different tractors as indicated by the following range:

Less than 2000 ft.	1 tractor (the speed was 1967 ft.)
2000-2199	3 tractor
2200-2399	2 tractor
2400-2599	2 tractor
2600-2799	9 tractor
2800-2999	3 tractor
3000-3199	6 tractor
3200-3399	6 tractor
3400-3599	5 tractor
3600-3799	1 tractor
3800-3999	3 tractor
Above 4000	3 tractor

A great number of other factors can be observed from the reports of the tractor testing work but I have purposely refrained from touching on any of them here, thinking that it would be better to wait until all the records are available and then present figures similar to these but based on all tractors tested and in addition give other items that might be of interest to those connected with the farm power question.

The Importance of Heat in the Correct Ventilation of Hog Houses

By W. B. Clarkson [1] and C. S. Whitnah [2]

THE modern hog house has a dual purpose; first, to provide proper housing conditions for farrowing purposes; second, to maintain a sanitary home for growing hogs for the balance of the winter.

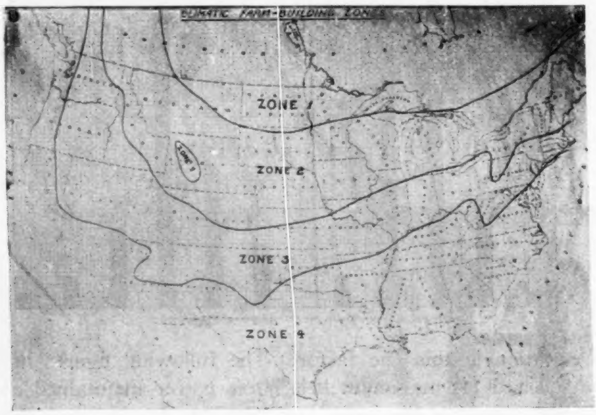


Figure 1

For farrowing purposes it is necessary in cold climates to provide artificial heat, in order to maintain a comfortable temperature. A building properly constructed for each climatic zone (see Fig. 1), and filled with feeders, may not need artificial heat.

In the last annual report of the committee on farm building ventilation a table was presented, showing that the average 300-pound hog should not be expected to heat more than 240 cubic feet of space in a properly ventilated room.

Analysis of the comparative merits of hog houses shows that there is a correct relation between ventilation, heat and light.

In making comparisons of these factors we have selected nine typical hog houses. (Several other types could be added but these are sufficient to make clear the purpose of this article.) Type No. 1; the two-story building with overhead storage. Type No. 2; the one-story building with a flat pitch gambrel roof and a ceiling extending across from one hip of the roof to the other. Type No. 3; the sawtooth roof. Type No. 4; the one-story gable roof. Type No. 5; the half-monitor roof. Type No. 6; the same as No. 2, leaving out the ceiling, but insulating under the rafters with one-half-inch insulation and covered with

[1] King Ventilating Co. Mem. Amer. Soc. A. E.
[2] King Ventilating Co. Jun. Amer. Soc. A. E.

D. & M. flooring. Type No. 7; the same building as No. 2, but with inclined ceiling on each side extending from hip of roof down to girders and across between the girders. No. 8; a full monitor roof. No. 9; a shed roof.

A cross section of each type is shown in Fig. 2. Each shown for the same size building, 22′-8″ wide by 40 feet long, inside measurements, except No. 9 which is 10′-8″ wide and 80 feet long.

To illustrate that heat should be considered in planning the hog house we are showing the relative heat loss from each of these buildings when the windows are placed as

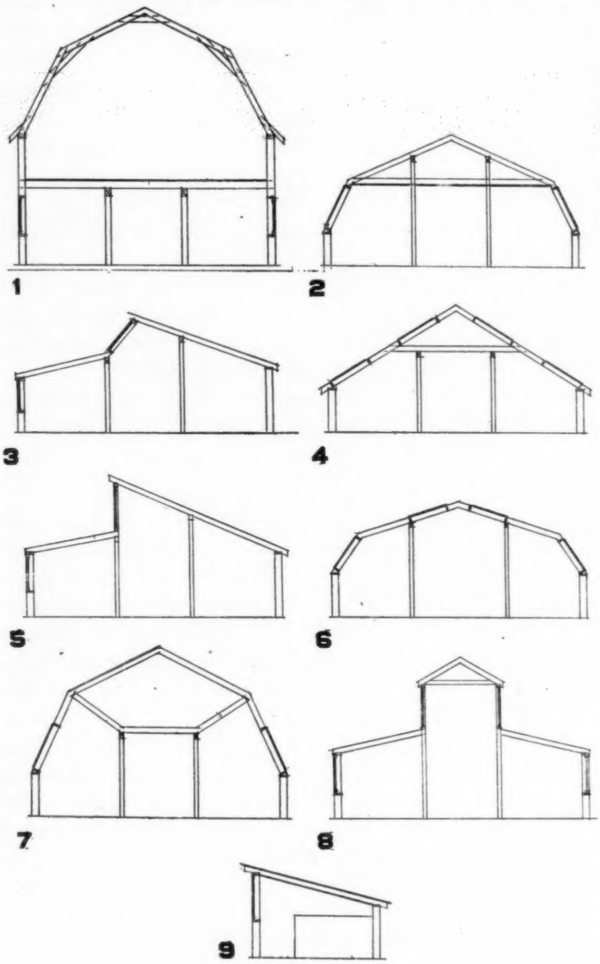


FIGURE 2

is common practice. Table No. 1 shows these window areas in each type.

TABLE NO. 1—AMOUNT OF GLASS SURFACE

Type 1	20 windows	9″x10″	6 light sash	100 sq. ft.
Type 2	28 windows	9″x14″	6 light sash	140 sq. ft.
Type 3	10 windows	9″x14″	6 light sash	
	10 windows	9″x10″	6 light sash	90 sq. ft.
Type 4	20 windows	9″x10″	6 light sash	100 sq. ft.
Type 5	10 windows	9″x14″	6 light sash	
	10 windows	9″x10″	6 light sash	90 sq. ft.
Type 6	20 windows	9″x10″	6 light sash	100 sq. ft.
Type 7	28 windows	9″x14″	8 light sash	196 sq. ft.
Type 8	20 windows	9″x14″	6 light sash	
	20 windows	9″x10″	6 light sash	180 sq. ft.
Type 9	20 windows	9″x14″	6 light sash	100 sq. ft.

Table No. 2 shows the estimated relative loss of heat from each type of building when built according to the following specifications:

FIGURE 3

Walls: Studded framed with shiplap, insulation and drop siding outside the studding; one-half inch insulation and D. & M. flooring inside.

Ceiling; one-half inch insulation and D. & M. flooring, except in numbers 1, 2 and 7, which require only a tight ceiling insulated with straw or hay above.

Windows; one-piece sash fitted to frame, with tight stops not made to hinge or slide. Storm windows tightly fitted with not less than one inch space between glass surfaces.

Doors; made of two thicknesses of D. & M. flooring, with half inch thickness of good insulating material between and properly fitted to frame.

These specifications are suitable for houses located in the first zone, as shown on the map entitled "Climatic Farm Building Zones." (Fig. 1.)

TABLE NO. 2—RELATIVE HEAT LOSSES IN HOG HOUSES, FIRST ZONE CONSTRUCTION

Type	Wall		Roof		Windows				Total
No.	Area	Loss	Area	Loss	Wall	Monitor	Skylight	Loss	Loss
1	902	162			100			40	202
2	572	103	260	52			140	70	225
3	850	153	820	164	40		50	41	358
4	672	121	980	196			100	50	367
5	971	175	960	192	40	50		37	404
6	672	121	980	196			100	50	367
7	712	128	404	81			196	98	307
8	1012	182	960	192	80	100		75	449
9	1079	194	880	176	100			40	410

Table No. 3 shows heat loss in each building when made of materials and construction suitable for third zone and subjected to the low temperatures prevailing in the first zone, to-wit: Walls built of matched lumber single thickness, single windows well fitted to casing, single doors and a single thickness matched lumber ceiling in types Nos. 1, 2 and 7.

TABLE NO. 3—RELATIVE HEAT LOSSES IN HOG HOUSES, THIRD ZONE CONSTRUCTION

Type	Wall		Roof		Windows				Total
No.	Area	Loss	Area	Loss	Wall	Monitor	Skylight	Loss	Loss
1	902	496			100			120	616
2	572	324	260	200			140	210	734
3	850	457	820	631	40		50	123	1211
4	672	369	980	755			100	150	1274
5	971	584	960	740	40	50		120	1444
6	672	369	980	755			100	150	1274
7	712	391	404	311			196	294	996
8	1012	557	960	740	80	100		221	1518
9	1079	592	880	678	100			120	1390

Rules for Computing Heat Losses

The coefficients of heat loss used in the above computations were as follows: (These are taken from recognized authorities.) This coefficient is the heat loss in B.T.U. per square foot per degree difference in temperature.

	First Zone	Third Zone
Walls	0.18	0.55
Roof	0.20	0.77
Wall Windows	0.40	1.20
Monitor Windows	0.43	1.25
Skylight Windows	0.50	1.50

In types 1, 2 and 7 where the ceilings were assumed to be covered with packed straw or other roughage, the heat loss was disregarded.

A study of these tables shows that a proper consideration of heat and ventilation and the correct size and location of windows will produce a well-balanced hog house.

Everything else being equal the house that has the least cubic space per hog is the one that is warmest on a cold day. Table No. 4 shows this relation in the several types of houses.

TABLE NO. 4

Type No.	Inside Dimension	Floor Area	Cubic Space
1	40'x22'8"	906.8 sq. ft.	6346 cubic feet
2	40'x22'8"	906.8 sq. ft.	6640 cubic feet
3	40'x22'8"	906.8 sq. ft.	6813 cubic feet
4	40'x22'8"	906.8 sq. ft.	7026 cubic feet
5	40'x22'8"	906.8 sq. ft.	7586 cubic feet
6	40'x22'8"	906.8 sq. ft.	7620 cubic feet
7	40'x22'8"	906.8 sq. ft.	7766 cubic feet
8	40'x22'8"	906.8 sq. ft.	7857 cubic feet
9	80'x10'8"	853.6 sq. ft.	5546 cubic feet

A natural draft system of ventilation should be more efficient in No. 1 because of the double advantage of increased air pressure at the higher elevation and the length of the ventilating flues, which carry the warm light air from the room, thus causing increased and more positive draft. Since type No. 1 is the warmest type as shown in tables Nos. 2 and 3, this house provides the best condition for maintaining the proper temperature and makes the best provision for ventilation.

It is apparent that the low flat roof types have some advantage in the matter of light, as shown in table No. 1, but there are disadvantages to be considered:

First: Snow and ice gather on flat roof windows which must be removed if the windows are to perform the service intended. Climbing on the roof is not an easy job and is seldom done, therefore, much of the value of the glass in a hog house is lost in winter in the first and second zones.

Second: Unless carefully installed, skylights are not watertight and always leak more or less in the thawing seasons.

Third: Authorities agree that the heat loss through a skylight is greater than through a vertical window.

The accompanying picture [Fig. 3] shows the snow-covered skylights in a flat roof type of hog house. In this house the heat loss was so great last winter that when the ventilating system was tightly closed and the house filled to capacity, the temperature of the room could not be raised above freezing when the outside temperature was about zero degrees F.

Conclusions

First: Windows in the roof of a hog house should be fitted so they are water-tight and covered with storm sash equally well installed, so the frost will not gather on the glass and the heat loss through the glass be reduced to a minimum.

Second: In cold climates a properly insulated ceiling over a hog house will reduce condensation and help to maintain a comfortable temperature in the room.

Third: The comparative merits for light, and for heat and ventilation of the nine types of hog houses under discussion seem to be shown by the above tables.

Fourth: A well-balanced hog house has the proper amount of glass area located to give good light and is designed to retain the animal heat for ventilation.

S. H. McCrory, who was appointed by President Kranich to represent the American Society of Agricultural Engineers at the meeting of the Federated Engineering Societies, November 18 and 19, and a meeting of the executive committee on November 20, at Washington, reported a good meeting. Mr. McCrory was appointed to two committees, the one on "Plan and Scope" being of considerable importance. Quoting from Mr. McCrory's report: "The meeting was marked by harmony throughout, and I believe the formation of the American Engineering Council will mark the beginning of a new epoch in the engineering world. If properly supported the Federated Societies should soon be in a position to speak with as great or greater authority on engineering questions than the American Bar Association does on legal questions, or the American Medical Society on medical matters."

The Tractor and Thresher Department of the National Implement and Vehicle Association held a meeting at the Congress Hotel in Chicago, November 18 and 19. The following members of the American Society of Agricultural Engineers were on the program: Messrs. Finley P. Mount, J. A. Secor, A. H. Gilbert, H. B. Dinneen, George Collins, J. B. Bartholomew, and F. N. C. Kranich. President Kranich gave an address upon the "Coöperation with the American Society of Agricultural Engineers."

Tractor Service---Curative or Preventative---Which?

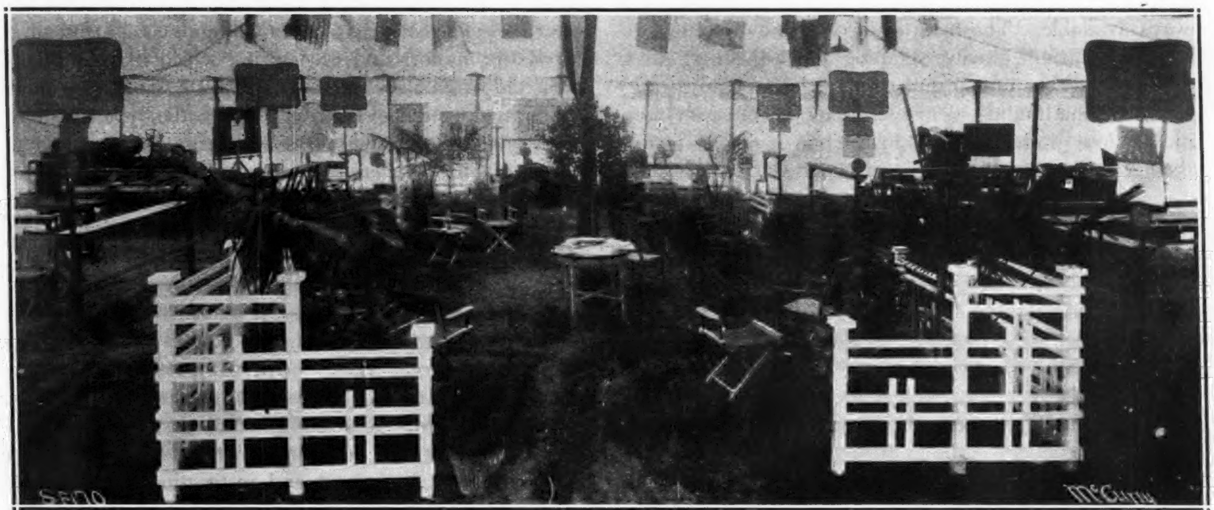
L. J. Fletcher [1]

"THERE are two kinds of tractor service," are the words of George Collins, Executive Secretary of the California Tractor and Implement Association, "curative—the dealer variety, and preventive — the school variety." The operator, and not the dealer's service man, determines the success of the tractor. Power farming will advance just as fast as the farmers' ability to operate properly and maintain this new and complicated equipment, and no faster. Tractor manufacturers and dealers find service policies and costs not the least of their worries.

Of fifty tractors of the same make and model sold in one section, why do a certain number require a big majority of the attention of the service department? Is the owner, who buys the most repair parts in a season, the best booster for the tractor?

A number of manufacturers have held tractor schools in the past. However, a few companies should not be asked to carry on this work which benefits all. The job of training the vast potential army of tractor users in this country can be best and most quickly accomplished through the full coöperation of the tractor manufacturers and dealers and the agricultural engineering departments of the colleges and universities. Each furnishes that which the other lacks. The present situation in California tends to illustrate this.

Power farming has advanced rapidly in this state. The California farmer uses more mechanical than animal power. On September 1st of this year he had in service 17,380 tractors, 33,550 electric motors, over 45,000 stationary gas engines, and a large number of motor trucks. The causes generally assigned for the extensive use of tractors in this state are: a twelve month working season; large ranches requiring plowing, seeding and harvesting in a limited time; orchards requiring frequent cultivation; cheap fuels, and the very hot summer months prevailing in some parts of this state, making the use of horses almost impossible. But may not this condition be due in part to the fact that tractor companies have fostered and helped in every way possible the tractor short courses and other educational activities of the universities and high schools? The two tractor associations in this state simply ask that their members be told how and where they can serve, and they are always ready to help any place and time And this "help" often means the sending of tractors and men during their busy seasons.



General View of State Fair School Tent

One enthusiastic member remarked at the last June meeting of the California Tractor and Implement Association: "Give a tractor course at the State Fair this fall. What do you want from us?" The exhibit of pow-

[1] Head of the Dept. of Agr. Engr., University of California. Mem. Amer. Soc. A. E.

er farming machinery is one of the features of the Fair, but to undertake to hold a short course for the thousands of visitors was another matter. When the Fair opened, however, the tractor school was there.

It was located in a tent seventy feet square in the midst of the general power farming exhibit, including tractors, trucks, pumps, combined harvesters, etc. The students did not enroll in this school, but rather a "cafeteria" system was employed. The work was mostly confined to tractor repairing, and then only those parts that were easily demonstrated and of the most importance. Various tractor companies and the Agricultural Engineering Division of the University furnished the equipment and instructors. Thousands of people passed through the tent during the nine days of the fair, and the "students" were those who stopped and asked for information. Eight spaces were divided off and in each an instructor and equipment were always available. The main lines of work offered were piston ring fitting, bearing scraping and adjusting, valve grinding, magneto timing and care, carburetor adjusting, ignition trouble finding, demonstrations of converters for handling low grade fuel, and instruction in power transmissions, such as belt lacing, shaft alignment, figuring pulley speeds, etc. Placards and signs were used extensively to inform the visitors that there was nothing to sell, everything was free and their patronage was earnestly solicited. The following legends are a sample of some of the "ice breakers": Do you know how to determine the firing order of a motor? What is the proper space between the ends of a piston ring? Can you line up a quarter turn belt? How do you locate a missing cylinder? Can you adjust the carburetor on your tractor?

The tent was arranged in an attractive manner with the use of decorative plants, fences, railings and signs. Easy chairs and periodicals were provided for the women folks so they could rest and pass the time pleasantly while the men "went to school." However, some of the women proved to be enthusiastic students themselves.

The entire cost of this school was paid for by the California Tractor and Implement Association. A conservative estimate would place the number of people, who stopped and asked for demonstrations, at 3,000.

Taken altogether, this school is in no way as effective as a regular tractor short course. A State Fair crowd is pleasure bent; time does not permit giving of tractor work. However, such work is well worth while if it does no more than convince the tractor owner that there is much he should know about the repair of his tractor.

The regular tractor short course should be made more effective. The nature of the work makes them expensive, but the Universities should do more in supplying competent instructors and equipment. There is an emergency which must be met. When the present generation of farmers are trained, then the work will be more or less self-perpetuating. The work should be taken to the farmer by means of extension short courses. The tractor companies are now doing their share in furnishing the tractors and men, but the salesmen or service men cannot be expected to step into a school room and become trained instructors. The colleges should own more equipment, such as tractors, motors and accessories, which may be taken apart and assembled. The University authorities should be educated to the difference between the type of short course which requires simply a lecturer, a blackboard and a piece of chalk, where the only limit to the enrollment depends upon the range of the speaker's voice, and the tractor short course, where the necessary equipment is measured in carloads, and the students, after hearing and seeing, immediately clinch the principles by applying them in practice work. This limits the students per instructor and increases the complication and cost of the school.

To reach the real tractor owner or prospective buyer, the tractor courses should be short; the purpose that of giving all the information and practice possible in one or two weeks rather than how long it will take to give it all. Even with good equipment and instruction, the courses will fail unless they are well organized. The general lectures should occupy no more than one-quarter of the total time, the remainder being practice work. The value of good demonstrations of the various repairs and adjustments, given to small groups, should not be overlooked.

Not until valve grinding and adjusting bearings become as familiar to the farmer as shortening a tug will the monkey wrench replace the curry comb.

Sanitation in the South

By H. R. Herndon [1]

The problem of "How to Improve Sanitary Condition in the South" is not lacking in scope or importance, as it concerns in an indircet way the entire population of the United States, and immediately the happiness and welfare of twenty-five million people in the twelve Southern states. How pressing this problem is was indicated in the summary rejection by the army examining boards of 33½ per cent of the men in the prime of life for service in the World War on account of physical disability, of which insanitary living conditions were a great predisposing factor.

Urban sanitation in the South presents no essential dif-

[1] Portland Cement Association, Dallas, Texas. Paper presented at Southern Section meeting of A. S. A. E.

ference from urban sanitation elsewhere, since yellow fever is no longer a considerable danger and we may leave it in the generally adequate hands of the respective city health departments. The sanitation of the towns, villages, and rural communities and homes is a problem all by itself, owing to the climate, sparseness of population in many sections, and diseases, crops, races, occupations, and modes of living peculiar to the subtropical regions.

The problem practically resolves itself into the improvement of sanitary conditions in the RURAL South, and will be so considered in this paper.

Before outlining a few of the lines along which the sanitation of the South will have to be conducted, it will be well to consider for a moment the conditions which call for improvement. The South—including the states of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma and Texas—had a poulation of twenty-five millions in 1910, of which about eighty per cent is rural. Of this population 67 per cent is white and 33 per cent is colored. The long, hot summers and short, mild winters, especially where the climate carries considerable moisture, are favorable to the propagation of insect pests and vermin that are agencies in the transmission of disease from the sick to the well, and the backwardness of the population and the reduced standard of living in the remoter rural sections—as evidenced by the high illiteracy rate—makes progress in the direction of sanitation extremely difficult.

The chief diseases of economic importance, due to insanitary living conditions, peculiar to the human population of the South are:

Malaria ....9,000,000 cases annually
Hookworm disease........2,000,000 cases annually
Enteritis........... 300,000 cases annually (Est.)
  Typhoid fever
  Cholera infantum (Summer complaint of children)
  Dysenteries

and the annual economic loss has been estimated by the U. S. Public Health Service at $900,000,000. Added to these diseases, there is the possibility, fortunately somewhat remote, of yellow fever outbreaks, due to the stegomya mosquito, and, because of exposure through the Mexican, Central American, and South American trade with our Gulf ports, of the rat-borne bubonic plague. The present bubonic infection which the Texas coastal cities are fighting with trap and concrete shows that the latter danger is always present. The death rate for all these diseases, with the exception of the rare yellow fever, and bubonic, is not high, but their debilitating effect upon the population, is exceedingly severe, and they call for the most heroic measures to combat them. As an example, malarial infection, in communities where it is prevalent runs up to 90 per cent of the entire population, and an infection of 50 per cent is very common. Hookworm infection, as shown by the investigations of the International Health Board (Rockefeller Foundation), which has done fine hookworm eradication in every southern state as well as in foreign lands, has a similar prevalence in communities where soil, climatic and living conditions favor its spread.

There are numerous diseases of farm animals peculiar to Southern climatic conditions, such as splenetic fever of cattle, scabies, etc., the eradication of which will be a factor in the sanitary advance of the human population through increasing agricultural profits and thus raising the standard of living. Furthermore, most of these diseases, like anthrax, tuberculosis, lumpy-jaw, etc., render the milk unfit for human consumption.

In sanitating a rural community, the job must be gone at farm by farm. Health work thus far seems to indicate that the vast majority of farm families with a very considerable experience of sickness, have little or no knowledge of sanitary principles. Out of 51,544 farm homes in fifteen counties twelve of which were in Southern states, visited in a recent test by representatives of the U. S. public health service, only 1.22 per cent were equipped for the sanitary disposal of human excreta; in 68 per cent the water supply used for drinking and culinary purposes was obviously exposed to potentially dangerous contamination from privy contents or from promiscuous deposits of human excreta, and unwholesome pollution from stable yard and pig sties. At only 32.88 percent of the farm homes were the dwellings effectively screened to prevent flies having free access to nearby deposits of human and other filth—from entering the dining room and kitchens and contaminating the foods for human consumption exposed therein. (P. H. *Bulletin No. 94.*) As the screens for protection against the malarial mosquito must be not coarser than a No. 16 mesh it is probable that the exposure to malaria in communities where conditions favored this disease was 100 per cent. Most farm families accept sickeness as a dispensation of Providence, and the milk-producer will continue to sell his milk with cases of typhoid in his family, and will bury a baby following an attack of summer complaint without thinking of screening his doors and windows. Yet the rural population is, in a manner of speaking, willing to learn, or, at least, is open to persuasion. In only ninety-one of the more than 50,000 farm homes in U. S. public health service fail to meet with a reasonably cordial reception.

As a conclusion of the test, Assistant Surgeon-General Lumsden makes the following remarks (U. S. Public Health *Bulletin No. 94*, p. 45):

> From the observations in these 15 fairly representative rural counties in the United States the following conclusions seem warranted:
> 1. Rural sanitation is needed.
> 2. Rural sanitation is feasible.

3. The cost of the work necessary to secure marked advancement in rural sanitation is many times less than the cost of the illness and of the physical inefficiency which will be prevented by such advancement, and, therefore, prolonged intensive, reasonably directed work for the advancement of sanitation in the rural districts generally of the United States would prove economic.

Confirming the above conclusion of Surgeon Lumsden, the following statements of results in anti-malarial work, consisting of drainage, screening houses, oiling pools, quinine treatment, etc., in certain localities in the South are given by the U. S. public health service:

In one group of plantations in Arkansas, the annual loss (cost of physicians, drugs, service, loss of time) was $11.21 per family; while in another group, under malarial control work, it was twenty-five cents per family. At Roanoke Rapids, N. C., having a population of 4,000, the labor efficiency was 40 to 60 per cent and there were fifty calls per day by physicians to give treatment. With one year of control work the efficiency of labor was 90 to 95 per cent, and the physicians' calls three per day. In the second year of control work the labor efficiency was normal and the physicians' calls were one in three days. The cost of control work was eighty cents per capita the first year and twenty-seven cents the second year. The labor efficiency doubled. At Wilson, Virginia, a rural community, the cost per capita of control work, was $15.40 the first year and twenty-five cents the second year. At Crystal City, Missouri, with a population of 8,000, the malarial cases were reduced 80 to 90 per cent, with a cost for the first year of eighty-eight and one-half cents per capita for control work and twenty-five cents per capita in the second year. In Crossett, Arkansas, a reduction from 1,650 cases to 288, or 82½ per cent, was made in the first year and still larger reduction in the second year. It was shown that the expense of control work increases or decreases inversely with the population per unit of area.

The work that has been done along agricultural lines in the building up of a great county agricultural force as a part of the extension workers of the state agricultural colleges contains a very helpful suggestion for sanitating the rural South, especially when viewed in connection with the fine demonstration work of the U. S. public health service and the International Health Board coöperating with the various state health departments. I consider that a necessary step in improving the sanitary conditions of the South is to bring about the creation of a great whole-time county health officer force in the 1,042 counties similar to the county agricultural agents' force, financed by the counties in coöperation with their respective state health departments, and perhaps with the U. S. public health service, (analogous to the Smith-Lever Act appropriations), so that the improvement of rural health conditions in each county shall be under a competent directing head with an adequate salary. In this way, anti-malarial work, hookworm eradication, proper sanitation of farm homes, timely examination of rural school children for remediable physical defects, and education of the people on how to keep well and live long can be aggressively pushed. As matters stand now, each small town and city and each county has its health officer, but he draws no salary, and receives pay principally for medical attention given to county paupers on accounts allowed by the respective boards of county commissioners. His livelihood is earned by a general practice over the country-side, and of course this business receives all his attention and disease prevention gets none at all. Or, he is appointed for political or personal reasons, neither of which have any relation to his fitness for the work to be done.

A second necessary step in improving sanitary conditions in the South is the carrying forward to completion of the great road building programs of the counties. There is a direct relation between the earning power of the farmer and the healthfulness of the conditions with which he will surround his home and in which he will rear his children. The change from bad roads to good roads in a county produces a greater economic effect and progress advance than probably any other single factor. Lands increase in value from 50 to 500 per cent (U. S. Department of Agriculture *Bulletin No. 393.*), schools are improved and better attended, homes on the highways are placed in good condition, more profitable types of farming may be engaged in, and the farmer's mental attitude toward community improvement and sanitation, and his social outlook, is changed for the better. A great advance will be made in every community in the improvement of sanitary conditions when that community is made a part of the world through improvement of the roads.

A great deal of the work is purely educational, and as the character of the farm population depends very largely upon what they read, the better class of periodical publications should go more generally to the farms, especially the juvenile publications. These should make a practice of carrying interesting and striking stories of rural sanitation work and how the mosquito, the rat, the fly, impure water, lack of drainage, soil pollution, filthy barns and feeding places for the live stock, and other insanitary agencies and practices react upon their own lives of the people on the farms with a frightful burden of sickness, inefficiency, and impoverishment. The business interests in the towns, perhaps through their chambers of commerce, could well afford to promote, even to the extent of financing, the placing of plenty of the right sort of reading matter in every farm home instead of leaving the farming population to soak up the tenets of half-baked economics, mostly carrying a political purpose, as its sole mental pabulum. It is certain that a great ad-

vance in rural sanitation and longer and better living would grow out of an influence so exerted.

The factor of farm tenancy enters into every problem of farm improvement in the South. This is especially the case where the placing of the farm home in a sanitary condition depends upon the landowner living, say, in the neighboring town, an expense which he generally can see no personal reason to incur. The law, of course, gives the tenant a lien on the landlord's share of the crop to compel the proper maintenance of the buildings, etc., but in most cases the tenant is poor—sometimes a negro or Mexican—and unable to hire a lawyer and furnish a cost bond, so the protection afforded him by the law is valueless. In many cases, the landlord is not without some apparent justification in refusing to make improvements, as the tenant, having no interest in the farm with his lease running for a year, will not avoid damaging the buildings and fences. Probably the greatest advance that can be made towards improving the sanitary conditions in the South will be in doing away with the present odious relationship between the landlord and the tenant, and substituting therefor an arrangement whereby the interest of each is best served by promoting the interest of both. This can very easily be done by incorporating into the laws of the states the principle in the Agricultural Holdings Act of England whereby the tenant is reimbursed by the landlord at the expiration of the lease and giving possession for all improvements made with the landlord's consent at their then value. With such a provision, the tenant will not hesitate to keep the buildings in repair, install sanitary improvements, build out rats, build fences, plant orchards, etc., and the problem of the county health officer in getting the dwellings, barns, and feedyards sanitated will be very largely put in a way to solve itself.

The use of concrete is almost indispensable where any building materials are used in connection with sanitary work. The concrete septic tank, sanitary privy, feeding floor, dairy barn and milk house floor, granary floors, and all other floors and foundations where rat-proofing is desirable, dipping vats for destruction of vermin on live stock, cisterns, troughs, tanks, storage cellars, poultry houses, and hog houses where it may be desirable to use fire as a cleansing agent in addition to flushing out with a hose, manure pits, well-linings, and drain tiling can all be made of concrete, and if well made are permanent as well as thoroughly sanitary. Every farm boy should have a good working knowledge of concrete construction, and every manual training school, every vocational agricultural school, and every agricultural engineering school should teach it.

The problem of how best to improve the sanitary conditions of the South is agricultural engineering on the broadest scale. It involves drainage engineering, sanitary engineering, public and community health work, road building and rural development, eradication of conditions favoring live stock diseases, and the improvement of schools and rural social life. It must be looked at in a big way. Agriculture must be made more profitable in conquering climatic, occupational, and racial diseases and making the terrain more healthful for man and beast. The agricultural engineer may help in promoting and assisting the agencies of improvement suggested in this paper, but he helps also in his class room work in teaching drainage, use of farm machinery and concrete.

The sanitation of the farms is a subject which should be taught in the agricultural engineering courses at the least, in an elementary way, and text books and lecture courses should be provided. This Association would do well to take action which will result in calling the subject to the attention of agricultural college presidents, and it should be further insisted that the principles of sanitation should also be taught in the secondary rural schools. The present generation of youths must be depended upon to subdue the conditions and make for disease in order that the term of human life may be further prolonged, that health—the foundation of happiness—may be secured, that the agricultural terrain may enter upon its full measure of productiveness, and that the American nation may receive a renewal of sanity and patriotism by the proper conservation and development of the rural population. This dependence will be realized only if the proper courses of instruction are given them, supplementing effectively the agencies which are already at work.

DISCUSSION OF H. R. HERNDON'S PAPER

By J. A. LePrince [1]

THE paper just read is a most excellent one, yet it tells only a part of the story. The big problem of sanitation today is to determine the best method of getting to that part of the public that needs it most the information that the sanitarian knows they are in urgent need of, and then to help in establishing the desired results at a reasonable cost, so that the change will be of financial advantage to the rural population. I sincerely believe that it would be a mistake to discuss this subject without inviting the attention of you gentlemen to the need of a committee on sanitation within your association to assist in helping to change the present health status of the agricultural worker in the South. Information such as has just been presented should be presented to the farmers of this country at their meetings so as to help them to help themselves. The State Health Officer of North Carolina hit the nail on the head when he stated we are preaching sanitation to sanitarians instead of helping that part of the public most in need of it, who will make the desired changes if the matter is effectually presented. The pro-

[1] Senior Sanitary Engineer United States Public Health Service. Mem. Amer. Soc. A. E.

(Continued on page 81)

Agricultural Engineering

The Journal of the American Society of Agricultural Engineers
PUBLISHED MONTHLY BY THE SOCIETY AT AMES, IOWA

F. N. G. KRANICH .... President
F. W. IVES .... First Vice President
W. B. CLARKSON .... Second Vice President
J. B. DAVIDSON .... Secretary-Treasurer
FRANK P. HANSON ...... Ass't Secretary in charge of publication

Subscription, $3.00 per year. Per copy, 30 cents. Canada, 50 cents additional; foreign, $1.00 additional.

Annual Meeting at Chicago

Programs for what promises to be the greatest annual meeting of the American Society of Agricultural Engineers have been printed and mailed.

The meeting will be held in the Crystal Room, Hotel Sherman, Chicago, December 28, 29 and 30.

The program will be as follows:

MONDAY AFTERNOON, DECEMBER 27

2:00 Meeting of Council at office of A. J. R. Curtis, Portland Cement Association, Chicago.

TUESDAY MORNING, DECEMBER 28

9:00 Registration.

10:00 (a) Call to Order—W. G. Kaiser, chairman of Committee on Local Arrangements.

(b) President's Annual Address—F. N. G. Kranich, Hyatt Roller Bearing Co., Chicago.

(c) Land Clearing with Dynamite — Arthur L. Kline, Hercules Powder Co., Wilmington, Del.

TUESDAY AFTERNOON

2:00 (a) Wagon Standards — E. E. Parsonage, John Deere Wagon Works, Moline, Ill.

(b) Some Factors Influencing the Draft of Plows — E. V. Collins, Asst. Chief Agr. Eng., Iowa Exp. Station.

(c) Standards Committee Report—Raymond Olney, chairman.

TUESDAY EVENING

7:45 (a) Address — Henry Prentice Armsby, Director Institute of Animal Nutrition, Pennsylvania State College.

(b) Preservative Treatment of Timbers in Farm Structures — E. C. Mandenburg, Barrett Company, Chicago.

(c) Wood Preservation—A National Economy.

(d) Smoker.

WEDNESDAY, DECEMBER 29 — MORNING SESSION

9:00 Educational Program.

L. J. Fletcher, Dept. of Agr. Engr., University of California, Davis, Cal.

S. H. McCrory, Dept. of Rural Engineering, Bureau of Public Roads, U. S. Dept. of Agr., Washington, D. C.

T. H. McDonald, Chief of Bureau of Public Roads, U. S. Dept. of Agr., Washington, D. C.

Psychological Tests for Technical Efficiency in Agricultural Engineering—Dr. H. E. Burtt, professor of psychology, Ohio State University, and F. W. Ives, president Agricultural Engineering Co., Columbus, Ohio.

Education and Extension Committee Report — F. A. Wirt, chairman.

Publicity Committee Report — W. B. Jones, chairman.

Research and Data Committee Report — E. A. White, chairman.

Membership Committee Report — J. B. Davidson, chairman.

AFTERNOON SESSION

2:00 (a) Artificial Heating of Animal Shelters — K. J. T. Ekblaw, engineering editor, National Farm Power, Chicago, Ill.

(b) Importance of Machinery as Related to Agriculture — J. R. Howard, president American Farm Bureau Federation.

(c) Tractor Testings — O. W. Sjogren, head of Agricultural Engineering Department, University of Nebraska.

WEDNESDAY EVENING

6:30 Banquet.

THURSDAY, DECEMBER 30 — MORNING SESSION

9:00 Committee Reports.

Farm Buildings Equipment — F. H. Williams, chairman.

Drainage — J. A. King, chairman.

Belt and Field Machinery — L. W. Chase, chairman.

Tractor — A. H. Gilbert, chairman.

Stationary Engines — E. R. Wiggins, chairman.

Sanitation — H. W. Riley, chairman.

Horse — A. E. White, chairman.

Roads — E. B. McCormick, chairman.

Barn Ventilation — W. B. Clarkson, chairman.

Farm Lighting — L. S. Keilholtz, chairman.

Irrigation — O. W. Israelson, chairman.

Farm Structures — W. G. Kaiser, chairman.

11:00 Annual Business Meeting and Installation of Officers.

If you know the present address of any of the following men please favor the secretary with such information: Geo. J. Baker, James A. Farra, H. G. Cox, P. A. Welty, E. L. Woods, J. W. Carpenter, J. D. Eggleston.

Committee Reports

THE REPORT OF THE STANDARDS COMMITTEE OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS FOR THE YEAR 1920

The interest aroused during the year in the standardization of farm equipment is unprecedented in the history of the industry. The demand for standardization is constantly increasing; it is a fact also that at the present time this demand comes largely from the manufacturers, and least of all from those who obviously need it the most — the farmers. This greater interest apparent the past year is unquestionably due for the most part to the coming into existence of the Agricultural Equipment Standards Committee, which was created during the latter part of 1919 by a joint committee representing the American Society of Agricultural Engineers and the National Implement and Vehicle Association, officially, and the Society of Automotive Engineers, unofficially, to coördinate the farm-equipment standards work of all engineering and commercial organizations, to avoid duplication of standards, and to encourage and foster the development of new standards.

The activities of the standards committee for the year have been confined largely to getting new work on standardization under way. The process of getting standards developed to the point of final adoption is at present necessarily a slow one, on account of the comparative newness of the work and the comparatively recent establishment of the coöperative arrangement with the National Implement and Vehicle Association mentioned in the preceding paragraph. With certain changes in the constitution and by-laws of this society, which will be included as a part of the recommendations of this report, it is anticipated that such provision will result in more effective organization and functioning of the standards committee and will facilitate the consideration and adoption of standards by the society as a whole.

For the purposes of this report the present status of standards work will be divided into three parts: (1) Standards now ready for final adoption by the society, (2) standards in process of development, and (3) standards work in contemplation. It should perhaps be explained at this point that there is indeed no prospect of the standards committee getting out of a job, at least for many years to come; the manufacturers are making urgent demands on the committee to develop standards of all sorts, and it is with the idea in mind of speeding up the work that the recommendations of this report are made.

I. Proposed standards ready for final adoption:

1. Standard belt speeds, in which it is proposed to include five standard speeds — 1500, 2600, 3000, 3250, and 3500 feet per minute.
2. Standard tractor and plow hitches, which include height of vertical hitch on tractor and lateral adjustment for plows of two, three, and four bottoms.
3. Farm wagon standards, including the standard automobile track of fifty-six inches and tire widths for wagons of various capacity ratings.

II. Standards in process of development:

1. A standard code for testing and rating the belt and drawbar power of tractors.
2. A standard manger form for dairy barns.
3. Standard rating for litter carrier capacities and dimensions.
4. Standard rating for capacities and power requirements of ensilage cutters.
5. Consideration of the standardization and elimination schedules of the National Implement and Vehicle Association with the view to approving those schedules and to making further recommendations for definite standards. Work is already under way in connection with the left-hand plow and the disk harrow blades schedules.

III. Standards work in contemplation:

1. Standard specifications of farm equipment steels.
2. Spraying machinery standards.
3. Standardization of lug equipment for tractors.
4. Standard code for rating the capacity and power requirements of grain threshers.
5. Standardization of sizes of tubing for stall and pen frames, pen fillers, gates, etc., in dairy-barn equipment.
6. Standardization as affecting ventilating equipment of farm buildings.
7. Nomenclature for farm equipment.
8. Standard width of rows of intertilled crops as affecting drills and cultivators.
9. Specifications for belting.
10. Lumber, oil and miscellaneous material specifications.
11. Disk harrow blades — diameter, thickness, curvature, punching and materials.
12. Rolling coulters — diameter, punching and materials.
13. Standardization as affecting plow bolts.
14. Standard rating for manure spreaders.
15. Standardization of fence posts, wire fencing, fence wire and bale ties.

The preceding list of proposed standards by no means includes everything in the way of standardization activities contemplated by the standards committee; it merely outlines some of the more important things that should have the attention of the committee as soon as it is possible to get to them. A list of things that could be standardized to the advantage of all concerned — manufacturer, dealer, and farmer — to be complete would indeed be a long one; its name is Legion.

In making recommendations for changes in the constitution and by-laws of the society, the standards committee would recommend first of all a complete recasting of the constitution and by-laws along the lines of some of the older engineering societies. Especially would we recommend such changes as would result in greater activity of the council in the government of the society and the conduct of its affairs.

As affecting the effectiveness and functioning of the standards committee and adoption of proposed standards by the society as a whole, we make the following recommendations:

1. At present the constitution provides for standing committees as follows: Research, standards, data, drainage, irrigation, farm sanitation, farm structures, farm buildings equipment, farm power, farm power machinery, farm field machinery, roads and manufacture of agricultural products. Our recommendation is that these thirteen committees be reduced to two — standards and research, provision to be made as required for sub-committees or divisions of these two committees, the scope of which will include everything comprehended in the activities of the eleven other committees. The organization of the standards committee on the basis of several sub-committees of which the chairman, at least, of these sub-committees shall be members of the general standards committee, will have the following advantages: (1) It will make possible better coördination of standards work; (2) it will result in the appointment of men best fitted to undertake particular lines of standard work as chairman of the various sub-committees; (3) it will delegate responsibility for getting results to a larger number of individuals; (4) it will give the chairman of the general committee more time for matters of organization, planning, coördination, etc., of the work of the committee as a whole; and (5) it will permit of undertaking a larger volume of standardization work at one time, that is, of getting a greater number of investigations of proposed standards under way.

2. As at present provided for in our constitution it requires from one to two years for the final adoption of a standard. While this provision has its advantages in some respects, it does seriously hamper the coöperation of this society with the other organizations represented on the Agricultural Equipment Standards Committee in so far as the final adoption of standards is concerned. We therefore recommend that the constitution at least be amended in such a way that our methods of adopting standards will not interfere with the activities of the Agricultural Equipment Standards Committee, and yet at the same time will avoid hasty action in adopting standards that have not proved their worth or practicability.

3. This committee further recommends that the constitution of this society provide for a constitution committee as one of its standing committees which will not only be empowered to revise or recast our present constitution, but will edit, revise, or formulate proposed amendments from time to time.

Respectfully submitted,

STANDARDS COMMITTEE,

Raymond Olney, Chairman,

K. J. T. Ekblaw,	M. R. Kelley,
Geo. W. Iverson,	G. B. Gunlogson,
O. W. Sjogren,	F. M. White.

REPORT OF THE STATIONARY ENGINES SECTION OF FARM POWER, BELT, AND FIELD MACHINERY COMMITTEE OF AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

E. R. WIGGINS, Chairman

Three conferences were held with Mr. J. E. Fuller, secretary of the National Gas Engine Association. Nothing constructive was done. Mr. Fuller, however, shows willingness to coöperate with the A. S. A. E. to do anything that will seemingly be to the betterment of the gas engine industry. The convention of the National Gas Engine Association, held in September, 1920, in Chicago, was attended by the chairman of this committee. A number of other A. S. A. E. members also attended, among whom were Mr. Olney, Kranich, White, and others. No concerted effort was made at this convention to get together with a committee of the N. G. E. A. to see what might be accomplished, although mention of such action was made at various times.

Mr. Fuller should be invited to attend the coming meeting of the A. S. A. E. to give his ideas as to how the A. S. A. E. can help the stationary gas engine industry. There is still a vast amount of work to be done with reference to standardization. In a number of interviews that the writer had during the past year with stationary engine manufacturing officials, it was found that standards are not wanted. The sales forces all seem to have the designers sold on the idea that everything should be different. The only thing the chairman can see for the A. S. A. E. to do for the stationary engine industry is a lot of pioneer work in engineering. This the writer has endeavored to do during the past year, and with very indifferent success.

REPORT OF THE BARN VENTILATION COMMITTEE OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

Memoranda of Computations of the Test Data in a Canadian Barn

BY PROF. J. P. CALDERWOOD

Recently the chairman of the Committee on Farm Building Ventilation has had a very interesting correspondence with Prof. J. P. Calderwood, head of the Department of Mechanical Engineering of the Kansas State Agricultural College.

Making use of some of the test data that has been secured by our committee, Professor Calderwood has applied the theory of heating and ventilation as used in estimating house heating problems, to this dairy barn.

The results of his investigation follow:

"The method of solution of these problems was, first, to use the barn and data of the Brandon Experimental Farm as a means of checking the application of the theory; and second, to apply the theory to other barns submitted. This procedure seemed logical, for the Brandon Experimental Farm Barn was representative of good construction, and furthermore, the values recorded in the test data served a splendid means of checking the results of the calculation.

The mathematical calculation in this investigation consisted in determining the amount of heat transmitted through the walls, ceiling, and floor of the barn. The constants for the unit heat transmitted for the various building materials were taken from recognized authorities. In the case of floors and in the absence of definite information as to the construction used, an equivalent of a three-inch concrete floor was assumed. In the case of ceilings, the roughage of feed stored in the loft would materially reduce the heat transmitted but for the case at hand it was assumed that nothing was stored in the loft and that the heat transmitted through the ceiling would be similar to ordinary house construction.[1] No heat other than that generated by the animals was considered. The heat generated per cow was taken as 3172 B.T.U. per hour as suggested by Professor King. In the absence of information as to the number of windows, the glass area of the barn was assumed as ten per cent of the total wall area.

HEATING AND VENTILATING THEORY APPLIED TO BRANDON EXPERIMENTAL FARM BARN

Dimensions	107½′ x 46′ x 8¾′ (inside)
Walls	24″ concrete (2″ air space)
External temperature	—14.5° F. (average of test)
Inside temperature	+42.4° F. (average of test)
Capacity of barn	65 cows
Animal heat generated per hour	65 x 3172 = 206,000 b.t.u.
Cubic space per cow	650 cubic feet
Heat transmitted per hour through walls of barn during test	84,850 B. T. U.
Difference of these heats or heat available per hour for producing ventilation	121,150 B. T. U.
Percentage of animal heat lost by radiation through walls, etc.	41%
Volume of air per hour the unused heat could raise to barn temperature	113,000 cubic feet
Volume of air per cow per hour	1,740 cubic feet

Note: In the actual test of the Brandon Experimental Farm Barn the actual measured air for ventilation exceeded the value found in the above calculations. This would indicate the addition of heat from other sources. Undoubtedly this heat came from the walls. The evening of the test was evidently the beginning of an extremely cold night. The heat thus stored in the walls during the day dissipated itself during the test.

The results could possibly be made more consistent by considering several other items. Thus, my value for the heat transmission through the ceiling is high because I assumed no straw or hay in the loft. One other fact I ignored was that the north wall of the barn was banked. The difficulty that I encountered in this respect was that I could not estimate the effect these items would have on the heat transmission.

I believe that if it were possible to test the Brandon barn for a period of say forty-eight hours or longer at a time when conditions could be maintained constant, that a reasonable check would result in the heat balance as calculated from theory and that secured from the test data.

Conclusions

The results of these calculations suggest the following conclusions:

1. The theory of heat and ventilation can be very effectively applied to barn ventilation and should be considered in the design or installation of barn ventilating systems.

2. The greatest cause for difficulty in barn ventilation is tracable to the large cubic space that is allotted per cow. This should only in rare cases be permitted to exceed 500 cu. ft.;[2] where this value is exceeded special attention should be given to the construction of the walls for heat insulation.

3. If 500 cu. ft. of space per cow is considered standard, little difficulty should be encountered in heating if reasonable construction is applied to the walls of the barn. The walls, ceiling and floor should be as nearly as possible wind-proof and the walls should be equivalent in heat insulation to that of a thirteen-inch brick wall; a twenty-four-inch concrete wall with two-inch air space; a twenty-six-inch stone wall; a six-inch hollow tile wall with one-half-inch plaster on both sides; or a frame wall of matched sheeting, studding, matched sheeting, paper and clap-board construction.

BARN VENTILIATION TEST AT BRANDON EXPERIMENT STATION

By Prof. L. J. Smith[3]

Barn Data

Cattle barn, 50 x 111½ ft. outside. Full bank barn north side, built summer of 1917.

Walls: Concrete, 22″ thick, with dead air space and vertical V joint inside, total thickness 24″, average distance to ceiling, 8¾ ft.

Gambrel roof with Shawver bents; 2 x 6 rafters; 2 x 8 studs, 18 ft. long on 2 ft. centres; 2 x 12 floor joist ceiled underneath witht V joint, and with shiplap, two thicknesses building paper and flooring for loft floor.

Capacity of barn, sixty-seven cattle — counting two calves equal to one cow. Cubic space per cow, 700 cu. ft. (107½′ x 46′ x 8¾′ inside = 4306 ÷ 67 = 645.8).

[1] As a matter of fact we understand the loft was filled with hay.—Signed W. B. Clarkson.

[2] Professor Calderwood's statement that the cubic space in a dairy barn should not exceed "500 cubic feet per cow" is logical, but dairymen are forced to use more space to properly handle the herd so that the one alternative is better insulation to minimize heat losses through walls, windows, ceiling and doors.—Signed, W. B. Clarkson.

[3] Manitoba Agricultural College.

Rutherford system of ventilation used with three outtake flues, 2 x 2 ft. inside and five intake flues of about half the total area of the outtake flues. Outtake flue area per animal — 25.8 sq. in.

Control damper of O. T. flue located at bottom of each flue, just above level of stable ceiling. Four air meter readings were taken at each test, two on each side of damper, which was in a vertical position in centre of O. T. flue.

Flue areas at damper — No. 1, 24 x 25; No. 2, 23 x 24; No. 3, 23 x 24 inches.

TEMPERATURES

Outside Barn	Time	Inside Stable, in Center, Half Way Between Floor and Ceiling
	5 P. M.	47
1 degree above	6:30	46 (from recording thermometer)
2 degrees F. below	7	46
7 degrees F. below	8	45
11 degrees F. below	9	43
12 degrees F. below	10	41
13 degrees F. below	11	42
15 degrees F. below	12	42
16 degrees F. below	2 A. M.	40 degrees F.
19 degrees F. below	3	40
20 degrees F. below	4	$39\frac{1}{2}$
22 degrees F. below	5	$39\frac{1}{2}$
23 degrees F. below	6	40
23 degrees F. below	7	43
20 degrees F. below	8:30	

RELATIVE HUMIDITY READINGS

8 P. M.	$42\frac{3}{4}$-$43\frac{3}{4}$ degrees F.	Relative Humidity
9	$41\frac{1}{4}$-$42\frac{1}{4}$ degrees F.	
11	$41\frac{3}{4}$-$42\frac{3}{4}$ degrees F.	
12	41 -42 degrees F.	
2 A. M.	39 -40 degrees F.	
5	39 -40 degrees F.	

Wind in west; 8 to 10 mi. per hr.; weather clear.

Summary

The tests were naturally divided into three periods:

First, when all three O. T. flues were open.

Second, when two O. T. flues were open.

Third, when one O. T. flue was open.

The writer did not want the temperature of the stable to fall below 40° F.

The first period, from 6:30 until 10 p. m. showed an average ventilation of 4590 cu. ft. per hr. per cow, which, allowing 120 cu. ft. of air breathed per hr. per cow gives a purity of 97.36%, which is considerably higher than Dr. King's ideal figure of 96.7 per cent. During this part of the test the outside temperature fell 13 degrees, while that inside the stable fell 5 degrees.

The second period. At 10 p. m. No. 1 O. T. was shut off completely, cutting down the out-take area one-third. This part of the test ran until 5:40 a. m., and, while the temperature outside fell 10 degrees, the inside temperature dropped only $1\frac{1}{2}$ degrees and held steady at $39\frac{1}{2}$ degrees F.; but the second O. T. flue was cut off to test the amount of ventilation, which might be had from the remaining flue.

The average amount of ventilation per hour, per animal, for the second period was 3870 cu. ft., which is still better than Dr. King's standard, being 96.9 per cent fresh air breathed.

The third period. Immediately upon closing the second O. T. flue, the barn temperature began to rise, changing from $39\frac{1}{2}$° F. to 43° in 2 hrs., 20 min., during which time the outside temperature dropped from 22 to 23 below zero. The recording thermometer showed that the stable temperature was still on the uniform increase when the test was stopped. During this period the animals were getting an average of 2594 cu. ft. per hr., or a purity of 95.4, which is still above the standard of 95 per cent, which is set for animals by many who have made a study of barn ventilation.

The interesting and valuable part of this test is the velocity of out-going air which averaged 711 ft. per min.

Another interesting fact is demonstrated in this test, namely, that the closing of the out-take flues does not decrease the air movement in proportion to the decrease in out-take flue area. The three out-take flues are all 24 x 24 inches inside. The following table shows the amount of ventilation in contrast to the out-take flue area:

No. of O. T. flues open	Area of O. T. flues open	Av. no. cu. ft. air per hr. per cow	Percent decrease in ventilation
3	12 sq. ft.	4540	0
2	8	3870	$14\frac{3}{4}$
1	4	2597	$42\frac{4}{5}$

Intake Regulation. During the first part of the test until 2:15 a. m., intake flue No. 1 was closed, No. 2 was open, No. 3 open, but partially clogged; No. 4 open, and No. 5 open. At 2:15 Nos. 2 and 4 were partially closed, the rest being left as before.

Condition of stable. The inside walls and ceiling of stable were free from frost or moisture, except in several small spots near the inside wall, on the ceiling above the scale, where ceiling was damp. This may have been partially due to the cold air entering from the feed room where the door was open. However, the loft floor was not well covered with feed throughout, which would tend to cause a cold ceiling and also to increase the heat losses from stable.

BARN VENTILATION DATA OF TEST OF CATTLE BARN, BRANDON EXPERIMENTAL FARM

O. T. Flue No.	Time of Test	Velocity of Air per Min.		Corrected No. Ft. per Min.		Av. No. Cu. Ft. per Min.	Total No. Cu. Ft. per Hr.	Cu. Ft. Air per Hr. per Grown Cow
	P. M.				Av.			
I	7:20	450						
		471	460	464				
	to				439.5	1,831		
		418						
	7:38	402	410	415				
II	7:30	390						
		392	391	397				
	to				409	1,568		
		409						
	7:40	421	415	421				

O. T. Flue No.	Time of Test	Velocity of Air per Min.	Corrected No. Ft. per Min.	Av. No. Cu. Ft. per Min.	Total No. Cu. Ft. per Hr.	Cu. Ft. Air per Hr. per Grown Cow
III	7:45 to 7:55	375, 390 } 382; 333, 362 } 348	388, 355 } 371½	1,424; 4,823	289,380	4,593
1	8:30 to 8:40	380, 385 } 382; 394, 367 } 380	388, 386 } 387	1,612		
II	8:40 to 8:50	415, 416 } 415; 404, 416 } 410	420, 415 } 417½	1,600		
III	8:50 to 9:00	388, 396 } 392; 365, 369 } 367	397, 374 } 385½	1,427; 4,639	278,340	4,418
I	9:30 to 9:40	410, 402 } 406; 470, 451 } 460½	411, 465 } 348			
II	9:40 to 9:50	435, 425 } 430; 393, 414 } 403½	430, 408 } 419	1,564		
III	9:50 to 10:00	387, 400 } 393½; 352, 365 } 358½	400, 365 } 382½	1,466; 4,855	291,300	4,623
Tests with Two O. T. Flues						
II	10:30 to 10:40	555, 557 } 556; 520, 536 } 528	559, 531 } 545	2,089		
III	10:45 to 10:55	534, 537 } 535½; 466, 458 } 452	538, 456 } 497	1,905; 3,994	239,640	3,803
II	11:35 to 11:45	565, 563 } 564; 561, 531 } 546	566, 549 } 577½	2,137		
III	11:45 to 11:55 A. M.	527, 542 } 534½; 477, 489 } 483	537, 487 } 512	1,963; 4,100	246,000	3,904
II	2:05 to 2:15	550, 548 } 549; 541, 495 } 518	552, 551 } 536	2,054		
Cut down inlets.						
III	2:20 to 2:30	508, 512 } 510; 442, 474 } 458	513, 462 } 487½	1,868; 3,962	237,720	3,773
II	3:05 to 3:15	525, 545 } 535; 490, 512 } 501	538, 504 } 521	1,997		
III	3:20 to 3:30	486, 516 } 501; 465, 469 } 467	504, 471 } 487½	1,868; 3,856	231,900	3,681
II	4:30 to 4:40	554, 576 } 565; 546, 524 } 535	568, 538 } 533	2,119		
III	4:50 to 5:00	546, 539 } 539½; 467, 410 } 438½	540, 443 } 491½	1,884; 4,003	240,180	3,812
II	5:20 to 5:30	569, 575 } 572; 565, 554 } 559½	575, 561 } 568	2,177		
Feed room door opened at 5:30 a. m.						
III	5:30 to 5:40	630, 659 } 644½; 560, 542 } 551	645, 555 } 600	2,300; 4,477	268,620	4,263
Closed No. III O. T. at 5:40.						
Tests with One O. T. Flue						
II	5:50 to 6:00	758, 770 } 764; 707, 705 } 706	764, 707 } 735½	2,819	169,140	2,684
II	6:10 to 6:20	749, 719 } 734; 698, 732 } 715	734, 716 } 725	2,779	166,720	2,646
II	7:10 to 7:20	702, 690 } 696; 657, 643 } 650	697, 651 } 674	2,584	155,040	2,461

DISCUSSION OF H. R. HERNDON'S PAPER

(Continued from page 75)

posed committee on sanitation referred to could determine to what extent the essentials of sanitation are being taught in our agricultural schools and colleges, so that a few words from the future successful demonstration agents can be made to count in the welfare of various communities where it is very much needed.

Our present system of rural sanitation frequently includes a part-time county health officer who does no real constructive health work and is often of little or no value to the rural population. Data is available to show to what a large extent the preventable diseases have been elim-

inated in parts of our southern states where the county health unit is properly directed by an all-time, efficient county health officer, but who is best adapted to invite the attention of our farming population to these matters?

In some counties which formerly had ninety per cent of rural homes without closets and where typhoid dysentery and hookworm were the rule rather than the exception, they have taken hold of their problem and now have less than five per cent of the rural homes without sanitary closets. The farmers find it cheaper to invest in practical sanitation than to pay for physicians' services, medicine, and unnecessary funeral bills.

The Malaria Investigations Division of the United States Public Health Service has been operating in the states referred to and you may be interested in some of its findings. The state of Mississippi is the only state that has any idea of the size of its malaria problem. Even in those parts of other states with a higher malaria sick rate than Mississippi no information as to the prevalence of malaria is available. On one of the plantations of the largest cotton planting farm in this country by actual blood examination it was proved that more than fifty per cent of the field hands had malaria. On another large plantation malaria caused a loss of over three dollars per acre per year. In one state there are over a thousand deaths a year from malaria and of course 200 or more cases for each death. The financial loss to the farmer is tremendous. Our rural population do not know and are being taught altogether too slowly that they are paying a large sum each year for the privilege of having malaria, when in most communities for a fraction of the cost they pay malaria could be eliminated and the output of the farm and its sale value increased.

At saw mill villages, cotton mill villages, and other communities where anti-malaria campaigns have been instituted, the output of the plant has been increased from ten to forty per cent, or as one mill manager stated, his sanitation investment gave the biggest return in dollars and cents of any investment his company had ever made.

In recent years there has been a big increase in the percentage of farm homes that are being screened, but unfortunately more than ninety per cent of screened buildings are ineffectively screened and keep out many pestiferous mosquitoes but not the malaria-conveying mosquito. The bill for screening is paid but results are not accomplished because the intentions are good but the execution equally poor. Many do not even know that fourteen mesh wire admits *Anopheles* and they screen windows and porch with sixteen mesh wire and buy fourteen mesh stock screen doors and thus turn their dwellings into a malaria mosquito trap.

In our army camps in 1860-65 and again in 1898, we had thousands of cases of malaria and altogether too many preventable deaths. In the recent war under similar camp conditions we should have had over 5000 deaths from malaria whereas due to precautions taken we lost only 31. About 1200 square miles of territory were controlled at a cost per acre far below what our farmers are now paying at their homes for doctors' bills, medicine and in lost time due to malaria. In a large part of the richest section of our farming country of the South the loss caused by malaria per acre per year is from one to over twelve dollars. The cost of malaria control measures in 200 square miles of demonstration areas now being carried out in the southern states this year with the present high laborers' wages will be less than $1.27 per acre and most of the drainage is permanent.

The South has a longer growing season than the North and consequently many advantages. With the elimination of typhoid, dysentery, hookworm, and malaria, the immigration southward should be large. Fortunately the preventive measures necessary for the elimination of first three diseases are one and the same. After preliminary drainage is accomplished we can care for malaria control measures and keep free of it if we know how and want to do so. This association can be of tremendous use to the South by coöperating with existing agencies through a committee interested in the health status of the southern farmer.

You may be interested to know that five states now have appropriations for malaria control demonstrations and that the St. Louis and Southern Railway is now spending $25,000 a year for such work and has found it to be an excellent investment after a series of investigational demonstrations.

It is stated that for every bale of cotton produced in the South forty dollars is spent in the North, so financially the problem is a nation-wide one and the production of our southern farms affect business industry and the wage earner beyond the malaria belt.

Mr. Herndon's paper is worthy of careful consideration, and I hope it will be widely read. It should result in awakening our agricultural colleges and schools as well as our farming population and those interested in the farmer's welfare and financial condition to activity. The health of the farmer is a problem of the utmost national importance and I hope this association will continue to be actively interested in improvement of the present neglected condition of rural sanitation in the South.

Two ballots were sent to the voting members of the society last month. One ballot will determine the officers of the society for 1921 and the other had reference to the American Society of Agricultural Engineers accepting the invitation of the Federated American Engineering Societies to become a charter member.

Orders for the "Transactions" can still be filled. Set eleven volumes (ten conventions) for members, $4.50; set eleven volumes (ten conventions) for non-members, $9. Send orders to the secretary.

C. C. Hermann was recently appointed chief engineer of the Litchfield Mfg. Co. His former capacity was that of efficiency engineer with the same concern.

The secretary has a limited supply of the American Society of Agricultural Engineering pins which can be purchased at cost price, $2.89.

New Members

Paul W. Stankee, designer, Gordon-Van Tine Co., proprietor Stankee Steel Specialty Works, Davenport, Iowa.

Douglas R. A. Drummond, editor, Canadian Power Farmer, Winnipeg, Manitoba.

J. H. Rees, vice president and general manager, Ohio Municipal Equipment Company, Columbus, Ohio.

John George Krenzke, chief draftsman, Advance-Rumely Company, La Porte, Indiana.

Charles Christopher Brogan, chief draftsman, Advance-Rumely Company, Battle Creek Works, Battle Creek, Michigan.

Willis D. Cook, vice president and chief engineer, Henneuse Tractor Company, Sacramento, California.

Chris Nyberg, chief draftsman thresher works, Advance-Rumely Company, LaPorte, Indiana.

Clarence Henry Wall, instructor of rural engineering, State School of Agriculture and Domestic Science, Delhi, New York.

G. B. Read, president, Portable Elevator Manufacturing Company, Bloomington, Illinois.

J. Lucas Hixon, chief inspector, Advance-Rumely Company, LaPorte, Indiana.

Douglas R. A. Drummond, editor Canadian Power Farmer, Winnipeg, Manitoba.

A. W. Fisher, sales engineer, Hyatt Roller Bearing Co., San Francisco, California.

H. O. K. Meister, sales manager, tractor bearing division, Hyatt Roller Bearing Company, Chicago, Illinois.

George Henry Russell, consulting civil-hydraulic and irrigation engineer, Lamar, Colorado.

Ray I. Shawl, associate in farm mechanics, University of Illinois, Champaign, Illinois.

J. H. Rees, vice president and general manager, Ohio Municipal Equipment Company, Columbus, Ohio.

Chas. A. Swan, tractor designer, Advance-Rumely Thresher Co., Battle Creek, Michigan.

James Ross, tractor designer, Advance-Rumely Company, La Porte, Indiana.

Carl Chester Harris, vice president and treasurer, Rodney Hunt Machinery Company, Orange, Massachusetts.

Wm. I. Ballantine, vice president, Advance-Rumely Company, LaPorte, Indiana.

R. E. Bosque, assistant professor, agricultural engineering, A. & M. College, College Station, Texas.

George L. Crook, works manager, Advance-Rumely Company, LaPorte, Indiana.

A. L. Fogle, general superintendent, Advance-Rumely Company, LaPorte, Indiana.

Wm. B. C. Mahler, engineer, Advance-Rumely Thresher Co., LaPorte, Indiana.

Richard M. Pruden, foreman experimental department, Advance-Rumely Company, LaPorte, Indiana.

Leon P. Christensen, irrigation engineer, Brigham City, Utah.

John Robert Haswell, farm mechanics extension and drainage engineer, Pennsylvania State College, Pennsylvania.

Charles Littleton Fultz, salesman, Fultz & Keiser, Lancaster, Ohio.

Charles Floyd Crumb, designer, International Harvester Company, Chicago, Illinois.

Rex Benner Hitchcock, experimental engineer and harvesting machine designer, International Harvester Company, Chicago, Illinois.

G. M. Merwin, designer of agricultural machinery, Berwyn, Illinois.

C. Harold White, superintendent Deere & Mansuer Works, Moline, Illinois.

Herbert Bell Sperry, designer, International Harvester Company, Chicago, Illinois.

Arthur Fife, irrigation engineer, Utah Experiment Station of Utah Agricultural College, Logan, Utah.

C. S. Bristow, assistant chief engineer, J. I. Case Plow Works Company, Racine, Wisconsin.

Frank Hazelton Smith, agricultural specialist, Roderick-Lean Mfg. Company, Newark, Ohio.

Roy Burton Gray, professor of agricultural engineering, Moscow, Idaho.

Robt. M. Mitchell. designer, International Harvester Company, Chicago, Illinois.

Application for Membership

All members are asked to promptly send all pertinent information, concerning the applicants, to the Secretary's office in order that it may be brought to the attention of the Council prior to the applicants' election.

Americo de Miranda Lucoff, special student in agricultural engineering, Ames, Iowa.

Joao V. do Oliveira, special student in agricultural engineering, Ames, Iowa.

Djalma Hees, student, agricultural engineering, Ames, Iowa.

Robert H. Coolidge, supervisor of production, U. S. Ball Bearing Manufacturing Company, Chicago, Illinois.

Ernest Wayne Smith, sales correspondent, John Lauson Manufacturing Company, New Holstein, Wisconsin.

Bernis B. Browne, instructor, Power Farming Tractor Division, Automotive School, Portland, Oregon.

George A. Fain, professor agricultural engineering, Georgia State College of Agriculture, Athens, Georgia.

G. M. Foulkrod, instructor in farm mechanics, Pennsylvania State College.

S. C. Hurley, salesman, Diamond Chain Manufacturing Company, Indianapolis, Indiana.

John Thomas McAlister, instructor in agricultural engineering, Mississippi A. & M. College, Mississippi.

David S. Weaver, instructor in agricultural engineering, Mississippi A. & M. College, Mississippi.

Albert Hoiland, president, Hoiland Mfg. Co., Fargo, North Dakota.

David P. Davies, vice president J. I. Case Threshing Machine Co., Racine, Wisconsin.

Harold W. Stoddard, Agricultural Sales and Service Division, Hercules Powder Co., St. Louis, Missouri.

L. C. LeBron, assistant professor of agricultural engineering, Alabama Polytechnic Institute, Auburn, Alabama.

Joseph Cumming Elliff, salesman and demonstrator for Hercules Powder Company, Little Rock, Arkansas.

Thomas C. Mead, associate professor of agricultural engineering, University of Idaho, Moscow, Idaho.

C. Frederick Cunningham, secretary and manager, Oliver Chilled Plow Works, South Bend, Indiana.